Sediment Trap Data Documentation

Introduction

Particle flux measurements through sediment trap deployments formed an important part of the OMEX II data set. In addition to the moored sediment traps deployed along the OMEX II ‘P’ line (42° 38’ N), drifting sediment traps were deployed as part of the Lagrangian Filament Study (Charles Darwin cruise CD114). In all, 103 parameters were determined on trap material by 5 Principal Investigators. This document describes the protocols used in their measurement.

To help you find the information you require quickly, the document is subdivided into sections that describe groups of closely related parameters. These are listed below as a series of hot links. Each section starts with the definition of the parameter codes covered, followed by a list of who measured one or more of those parameters by cruise. Next, there is a protocol section describing the methods used by each principal investigator. Finally, there may be comments on data quality that have been noted by BODC or have come to our attention.

The data are listed by ‘cruise'. The assignment of trap data to a cruise may seem a little strange. However, it is convenient for two reasons. First, it allows a convenient tool for subdividing the trap data without recourse to convoluted explanations. Secondly, it permits a consistent documentation format across bottle, benthic and trap data making the documentation easier to digest. For the purposes of this document, trap data are assigned to the cruise during which the trap collecting them was deployed.

<TIP> If you want to find out how a particular parameter was measured and know the parameter code then the fastest way to find the information you require is to use the *Acrobat* 'find' tool to search for the parameter code. Then use the 'find' tool again to search for the name of the principal investigator. This will take you straight to the protocol description you require.

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A description of the deployment and sample handling techniques employed for the drifting sediment trap deployments during CD114.

References

Full references for the papers cited in the protocol descriptions.

Mass, Carbon, Nitrogen and Silica Fluxes

Parameter Code Definitions

CCFXACXX Calcium carbonate flux
Weight loss on acidification of trap material
Milligrams/m^2/day

ICFXCNXX Inorganic carbon flux
Difference between C/N analyser results on total and acidified sediment trap material samples
Milligrams/m^2/day

MSFXDWXX Mass flux
Weighing dry trap material
Milligrams/m^2/day

OCFXCAXX Particulate organic carbon (POC) flux (acidified)
Carbon/nitrogen analyser on trap material
Milligrams/m^2/day

OPFXWOXX Biogenic silica (opal) flux
Wet oxidation of trap material
Milligrams/m^2/day

TCFXCNXX Total carbon flux
carbon/nitrogen analyser on trap material
Milligrams/m^2/day

TNFXCNXX Total particulate nitrogen ("PON") flux
Carbon/nitrogen analyser on trap material
Milligrams/m^2/day

Originator Code Definitions

Pelagia cruise PLG109 and Poseidon cruise PS237_1

135	Dr. Rolf Peinert	Kiel University, Germany
14	Dr. Lei Chou	ULB, Brussels, Belgium

Charles Darwin cruises CD114A and CD114B

61	Dr. Paul Wassmann	University of Tromsø, Norway

Originator Protocols

Dr. Rolf Peinert

The trap deployment and sample handling protocols are described in the section on Moored Trap Sampling.

Total mass flux and carbonate were determined by gravimetric techniques.

Particulate biogenic silica was determined colorimetrically after alkaline digestion of the sample. The data have been corrected for dissolution losses to the supernatant liquid, using dissolved silicate analyses of this liquid before and after deployment.

Particulate organic carbon and total nitrogen were determined using a CHN analyser on material that had been acidified to remove carbonate.

Dr. Paul Wassmann

Samples were collected using a drifting sediment trap array and processed as described in the section on Drifting Trap Sampling.

The filters were frozen and stored in a freezer. Back in the laboratory, the samples were analysed for organic carbon and total nitrogen on a Leeman Lab. CEC 440 CHN analyser after removal of carbonate by fuming in an exicator for 24 hours with concentrated HCl. Three replicates analyses were carried out on each trap sample.

Dr. Lei Chou

The samples were acidified to remove carbonates and then organic carbon and total nitrogen were determined in an Interscience NA-2000 elemental particulate analyser. Total carbon was determined by analysing an additional unacidified sample. Inorganic carbon was computed by difference.

The material analyses were converted to fluxes using the Kiel mass flux data.

Isotopic Composition

Parameter Code Definitions

D15NMTST Particulate total nitrogen ("PON") ^{15}N enrichment (delta-^{15}N)
Mass spectrometry on combusted sample (sediment trap material)
Parts per thousand

Originator Code Definitions

Pelagia cruise PLG109 and Poseidon cruise PS237_1

135 Dr. Rolf Peinert Kiel University, Germany

Originator Protocols

Dr. Rolf Peinert

The trap deployment and sample handling protocols are described in the section on Moored Trap Sampling.

The sediment trap material was suspended and collected on GF/F filters. The filters were combusted in a Fisons NA 1108 CHN element analyser connected to an isotope ratio mass spectrometer (Delta S, Finnigan, MAT). The reference gas was pure nitrogen from a cylinder calibrated against air as a standard following the protocols of Mariotti (1983).

Element Fluxes

Parameter Code Definitions

ALFXICXX Aluminium flux
ICP analysis of acid digested trap material
Milligrams/m^2/day

BAFXICXX Barium flux
ICP analysis of acid-digested trap material
Micrograms/m^2/day

CAFXICXX Calcium flux
ICP analysis of acid digested trap material
Milligrams/m^2/day

CDFXAAXX Cadmium flux
Atomic absorption analysis of acid digested trap material
Micrograms/m^2/day

COFXAAXX Cobalt flux
Atomic absorption analysis of acid digested trap material
Micrograms/m^2/day

CRFXAAXX Chromium flux
Atomic absorption analysis of acid digested trap material
Micrograms/m^2/day

CUFXAAXX Copper flux
Atomic absorption analysis of acid digested trap material
Micrograms/m^2/day

FEFXICXX Total iron flux
ICP analysis of acid digested trap material
Milligrams/m^2/day

KXFXICXX Potassium flux
ICP analysis of acid digested trap material
Milligrams/m^2/day

MGFXICXX Magnesium flux
ICP analysis of acid digested trap material
Milligrams/m^2/day

MNFXAAXX Manganese flux
Atomic absorption analysis of acid digested trap material
Micrograms/m^2/day

NAFXICXX Sodium flux
ICP analysis of acid digested trap material
Milligrams/m^2/day

NIFXAAXX Nickel flux
Atomic absorption analysis of acid digested trap material
Micrograms/m^2/day

PBFXAAXX Lead flux
Atomic absorption analysis of acid digested trap material
Micrograms/m^2/day

SIFXICXX Total silicon flux
ICP analysis of acid digested trap material
Milligrams/m^2/day

THFXICXX Thorium flux
ICP analysis of acid digested trap material
Micrograms/m^2/day

ZNFXAAXX Zinc flux
Atomic absorption analysis of acid digested trap material
Micrograms/m^2/day

ZRFXICXX Zirconium flux
ICP analysis of acid digested trap material
Micrograms/m^2/day

Originator Code Definitions

Pelagia cruise PLG109 and Poseidon cruise PS237_1

14	Dr. Lei Chou	ULB, Brussels, Belgium
170	Dr. Nathalie Fagel	University of Liège, Belgium

Originator Protocols

Dr. Lei Chou

Initial sample handling and distribution was undertaken by Kiel University. See the section on Moored Trap Sampling for further details.

The samples were analysed for trace elements by direct injection of solid samples as slurries using electrothermal atomic absorption spectroscopy in a Varian Spectraa-300 spectrometer with Zeeman correction.

Major elements were determined by Inductively Coupled Plasma emission spectroscopy after complete digestion of the samples by an HNO_3/HCl/HF mixture in a Teflon bomb in a microwave oven.

If there was insufficient material for the direct injection technique, trace elements were also determined on the digested samples either by ICP, if present in sufficient concentration, or by AA. The parameter codes have been set up to indicate the predominant method for the element.

The trace metal concentrations were converted to fluxes using mass flux data supplied by Kiel University.

Dr. Nathalie Fagel

Initial sample handling and distribution was undertaken by Kiel University. See the section on Moored Trap Sampling for further details.

The suspended sub-samples were filtered under the pressure of filtered air through 0.4 micron Nuclepore membranes. The filters were rinsed with deionised water and dried at 60°C and stored at room temperature in polycarbonate petri-dishes until analysed.

The filtered material was transferred to Teflon digestion bombs and dissolved overnight in a mixture of HNO_3, HCl and HF (4:2:1 by volume) at 80 °C. The volume of the acid was reduced by evaporation and the HF was neutralised with boric acid (0.4%). The element concentrations were determined by simultaneous and sequential Inductively Coupled Plasma Mass Spectrometry. The analyses were undertaken by the Royal Museum for Central Africa in Tervuren.

The trace metal concentrations were converted to fluxes using mass flux data from Kiel University. The data were supplied to BODC in units of nmoles/m^2/day (Ba, Th, Zr). They were converted to µg/m^2/day by multiplying by the atomic weight and dividing by 1000. The atomic weights used were:

Ba	137.33
Th	232.04
Zr	91.22

Chemical Composition

Parameter Code Definitions

ALCNPEXX Trap material aluminium content
ICP-AES analysis of trap material
Per cent

BACNICXX Trap material barium content
Inductively-coupled plasma mass spectrometry (ICP-MS)
Parts per million

BACNPEXX Trap material barium content
ICP-AES analysis of trap material
Parts per million

CACNPEXX Trap material calcium content
ICP-AES analysis of trap material
Per cent

CECNICXX Trap material cerium content
Inductively-coupled plasma mass spectrometry (ICP-MS)
Parts per million

DYCNICXX Trap material dysprosium content
Inductively-coupled plasma mass spectrometry (ICP-MS)
Parts per million

ERCNICXX Trap material erbium content
Inductively-coupled plasma mass spectrometry (ICP-MS)
Parts per million

EUCNICXX Trap material europium content
Inductively-coupled plasma mass spectrometry (ICP-MS)
Parts per million

FECNPEXX Trap material iron content
ICP-AES analysis of trap material
Per cent

GDCNICXX Trap material gadolinium content
Inductively-coupled plasma mass spectrometry (ICP-MS)
Parts per million

HFCNICXX Trap material hafnium content
Inductively-coupled plasma mass spectrometry (ICP-MS)
Parts per million

HOCNICXX Trap material holmium content
Inductively-coupled plasma mass spectrometry (ICP-MS)
Parts per million

KXCNPEXX Trap material potassium content
ICP-AES analysis of trap material
Per cent

LACNICXX Trap material lanthanum content
Inductively-coupled plasma mass spectrometry (ICP-MS)
Parts per million

LUCNICXX Trap material lutetium content
Inductively-coupled plasma mass spectrometry (ICP-MS)
Parts per million

MGCNPEXX Trap material magnesium content
ICP-AES analysis of trap material
Per cent

MNCNPEXX Trap material manganese content
ICP-AES analysis of trap material
Per cent

NACNPEXX Trap material sodium content
ICP-AES analysis of trap material
Per cent

NBCNICXX Trap material niobium content
Inductively-coupled plasma mass spectrometry (ICP-MS)
Parts per million

NDCNICXX Trap material neodymium content
Inductively-coupled plasma mass spectrometry (ICP-MS)
Parts per million

PBCNICXX Trap material lead content
Inductively-coupled plasma mass spectrometry (ICP-MS)
Parts per million

PRCNICXX Trap material praseodymium content
Inductively-coupled plasma mass spectrometry (ICP-MS)
Parts per million

PXCNPEXX Trap material phosphorus content
ICP-AES analysis of trap material

Per cent

RBCNICXX Trap material rubidium content
Inductively-coupled plasma mass spectrometry (ICP-MS)
Parts per million

SMCNICXX Trap material samarium content
Inductively-coupled plasma mass spectrometry (ICP-MS)
Parts per million

SRCNICXX Trap material strontium content
Inductively-coupled plasma mass spectrometry (ICP-MS)
Parts per million

SXCNPEXX Trap material sulphur content
ICP-AES analysis of trap material
Per cent

TACNICXX Trap material tantalum content
Inductively-coupled plasma mass spectrometry (ICP-MS)
Parts per million

THCNICXX Trap material thorium content
Inductively-coupled plasma mass spectrometry (ICP-MS)
Parts per million

TICNPEXX Trap material titanium content
ICP-AES analysis of trap material
Per cent

UXCNICXX Trap material uranium content
Inductively-coupled plasma mass spectrometry (ICP-MS)
Parts per million

WXCNICXX Trap material tungsten content
Inductively-coupled plasma mass spectrometry (ICP-MS)
Parts per million

YBCNICXX Trap material ytterbium content
Inductively-coupled plasma mass spectrometry (ICP-MS)
Parts per million

YXCNICXX Trap material yttrium
Inductively-coupled plasma mass spectrometry (ICP-MS)
Parts per million

ZRCNICXX Trap material zirconium content
Inductively-coupled plasma mass spectrometry (ICP-MS)
Parts per million

Originator Code Definitions

Pelagia cruise PLG109 and Poseidon cruise PS237_1

170 Dr. Nathalie Fagel University of Liège, Belgium

Originator Protocols

Dr. Nathalie Fagel

Initial sample handling and distribution was undertaken by Kiel University. See the section on Moored Trap Sampling for further details.

The suspended sub-samples were filtered under the pressure of filtered air through 0.4 micron Nuclepore membranes. The filters were rinsed with deionised water and dried at 60°C and stored at room temperature in polycarbonate petri-dishes until analysed.

The filtered material was transferred to Teflon digestion bombs and dissolved overnight in a mixture of HNO_3, HCl and HF (4:2:1 by volume) at 80°C. The volume of the acid was reduced by evaporation and the HF was neutralised with boric acid (0.4%). The major element concentrations were determined by simultaneous and sequential Inductively Coupled Plasma Atomic Emission Spectrometry. Inductively Coupled Plasma Mass Spectrometry was used for the trace elements. Barium was determined using both techniques. The analyses were undertaken by the Royal Museum for Central Africa in Tervuren.

The major element data (except sulphur) were supplied as oxide percentages. These have been converted to elemental percentages by BODC. The data were supplied with below detection limit and 'qualitative standard' flags. These have been flagged '<' and 'K' respectively in the database.

Note that these data may be combined with the Kiel mass flux data to provide element flux data if required.

Pigment Fluxes

Parameter Code Definitions

AXFXHPXX Alloxanthin flux
HPLC assay of acetone extract from trap material
Micrograms/m^2/day

BCFXHPXX Beta-carotene flux
HPLC assay of acetone extract from trap material
Micrograms/m^2/day

CLFXFMXX Fluorometric chlorophyll-a flux
Fluorometric assay of methanol extract from trap material
Micrograms/m^2/day

CLFXHPXX HPLC chlorophyll-a flux
HPLC assay of acetone extract from trap material
Micrograms/m^2/day

DXFXHPXX Diadinoxanthin flux
HPLC assay of acetone extract from trap material
Micrograms/m^2/day

FXFXHPXX Fucoxanthin flux
HPLC assay of acetone extract from trap material
Micrograms/m^2/day

HXFXHPXX 19-Hexanoyloxyfucoxanthin flux
HPLC assay of acetone extract from trap material
Micrograms/m^2/day

LUFXHPXX Lutein flux
HPLC assay of acetone extract from trap material
Micrograms/m^2/day

PHBXHPXX HPLC phaeophorbide flux
HPLC assay of acetone extract from trap material
Micrograms/m^2/day

PHFXFMXX Fluorometric phaeopigment flux
Fluorometric assay of methanol extract from trap material
Micrograms/m^2/day

PRFXHPXX Peridinin flux
Fluorometric assay of methanol extract from trap material
Micrograms/m^2/day

ZXFXHPXX Zeaxanthin flux
Fluorometric assay of methanol extract from trap material
Micrograms/m^2/day

Pelagia cruise PLG109 and Poseidon cruise PS237_1

135 Dr. Rolf Peinert Kiel University, Germany

Charles Darwin cruises CD114A and CD114B

61 Dr. Paul Wassmann University of Tromsø, Norway

Pelagia cruises PLG118 and PLG123

180 Dr. Marc Lavaleye NIOZ, Texel, the Netherlands

Originator Protocols

Dr. Rolf Peinert

The trap deployment and sample handling protocols are described in the section on Moored Trap Sampling.

Sub-samples of trap material were suspended, filtered through GF/F filters and frozen. Pigment concentrations were determined by reverse phase HPLC following the protocols described in Barlow et al. (1993). Frozen filters were extracted in 90% acetone, sonicated and centrifuged to remove debris. An aliquot (300 µl) of clarified extract was mixed with an equal volume of 1M ammonium acetate and 100 µl of this mixture was injected into a the HPLC system.

The spectral identification of the chromatogram peaks was conducted on a Waters PDA 991 photo-diode array at Kiel University.

Dr. Paul Wassmann

Samples were collected using a drifting sediment trap array and processed as described in the section on Drifting Trap Sampling.

The filter papers were extracted into methanol and fluorometrically assayed following the protocols of Holm-Hansen et al. (1965) on board ship.

Dr. Marc Lavaleye

Single-cup sediment traps were mounted on the ALBEX free-fall lander (Tengberg et al. (1995) and Tahey et al. (1996)) approximately 3m above the sea floor. The traps were closed during the descent and ascent of the lander. Sample accumulation was over a period of between half a day and two days.

The samples were freeze dried before being extracted into acetone containing a fixed volume of water. Pigments were assayed by HPLC using eluents, gradients and column similar to those described in Wright et al. (1991). Detection was by a photodiode array coupled with a fluorometer and the pigments were quantified as described in Tahey et al. (1994).

Taxon Fluxes

Parameter Code Definitions

PCFXMICB Cyanobacteria carbon flux
Optical microscopy
Milligrams/m^2/day

PCFXMICC Coccolithophoridae carbon flux
Optical microscopy
Milligrams/m^2/day

PCFXMICF Choanoflagellate carbon flux
Optical microscopy
Milligrams/m^2/day

PCFXMIDF Dinoflagellate carbon flux
Optical microscopy
Milligrams/m^2/day

PCFXMIFL Flagellate carbon flux
Optical microscopy
Milligrams/m^2/day

PCFXMIPT Total phaeocystis carbon flux
Optical microscopy
Milligrams/m^2/day

PCFXMISF Silicoflagellate carbon flux
Optical microscopy
Milligrams/m^2/day

PCFXMITD Total diatom carbon flux
Optical microscopy
Milligrams/m^2/day

PNFXMICC Coccolithophoridae cell flux
Optical microscopy
Number/m^2/day

PNFXMICS Scyphosphaera coccolith flux
Optical microscopy
Number/m^2/day

PNFXMIDF Dinoflagellate cell flux
Optical microscopy

Number/m^2/day

PNFXMIFO Foraminifera cell flux
Optical microscopy
Number/m^2/day

PNFXMIRA Radiolarians cell flux
Optical microscopy
Number/m^2/day

PNFXMISF Silicoflagellate cell flux
Optical microscopy
Number/m^2/day

PNFXMITD Total diatom cell flux
Optical microscopy
Number/m^2/day

PNFXMITT Tintinnid cell flux
Optical microscopy
Number/m^2/day

Originator Code Definitions

Pelagia cruise PLG109 and Poseidon cruise PS237_1

135	Dr. Rolf Peinert	Kiel University, Germany

Charles Darwin cruises CD114A and CD114B

61	Dr. Paul Wassmann	University of Tromsø, Norway

Originator Protocols

Dr. Rolf Peinert

The trap deployment and sample handling protocols are described in the section on Moored Trap Sampling.

The microscopic analysis of the samples was conducted using an inverted light microscope after settling a known volume of trap material sub-sample following the protocol of Utermöhl, 1958.

Dr. Paul Wassmann

Samples were collected using a drifting sediment trap array and processed as described in the section on Drifting Trap Sampling.

Phytoplankton was counted according to a combination of methods described in Smayda (1978). A standard light microscope, furnished with a counting stage (Semina 1978) was used. The whole sample was gently mixed. Counting of the pico- and most abundant nanoplankton algae (<2µm and 2-20µm, respectively), was carried out in the Fuchs-Rosenthal counting chamber with magnification of 400x.

After the smaller phytoplankton was enumerated, the samples were allowed to settle for a week, and then slowly decanted through a glass tube covered with two layers of fine-mesh nylon gauze to a 5-10ml concentrated sample. After gentle mixing, a sub-sample was transferred to a 0.05ml. chamber. Cells were counted under magnification of 200x.

In order to count rare (usually larger) forms, the whole sample was reduced to 1 ml by settling to a 1.0 ml chamber. As this was rather thick, only a low power objective (100x magnification) could be used.

Biovolumes of individual cells were calculated from linear dimensions of measured cells applied to appropriate stereometric formulae (Smayda 1978). The carbon content of the algae (PPC) was calculated based on average volume of the different species and according to Strathmann (1967)

Faecal Pellet Fluxes

Parameter Code Definitions

FCFXMECA Cylindrical faecal pellet (<25µm diameter) carbon flux
Inverse microscopy, stereometrical configurations from Elder (1979), carbon conversion from González and Smetacek (1994)
Milligrams/m^2/day

FCFXMECB Cylindrical faecal pellet (25-40µm diameter) carbon flux
Inverse microscopy, stereometrical configurations from Elder (1979), carbon conversion from González and Smetacek (1994)
Milligrams/m^2/day

FCFXMECC Cylindrical faecal pellet (40-60µm diameter) carbon flux
Inverse microscopy, stereometrical configurations from Elder (1979), carbon conversion from González and Smetacek (1994)
Milligrams/m^2/day

FCFXMECD Cylindrical faecal pellet (60-100µm diameter) carbon flux
Inverse microscopy, stereometrical configurations from Elder (1979), carbon conversion from González and Smetacek (1994)
Milligrams/m^2/day

FCFXMECE Cylindrical faecal pellet (>100µm diameter) carbon flux
Inverse microscopy, stereometrical configurations from Elder (1979), carbon conversion from González and Smetacek (1994)
Milligrams/m^2/day

FCFXMESZ Spherical faecal pellet carbon flux
Inverse microscopy, stereometrical configurations from Elder (1979), carbon conversion from González and Smetacek (1994)
Milligrams/m^2/day

FPFXMIAT Faecal pellet (appendicularian-type) flux
Optical microscopy on trap material
Number/m^2/day

FPFXMICT Faecal pellet (copepod-type) flux
Optical microscopy on trap material
Number/m^2/day

Originator Code Definitions

Pelagia cruise PLG109 and Poseidon cruise PS237_1

135	Dr. Rolf Peinert	Kiel University, Germany

Charles Darwin cruises CD114A and CD114B

61	Dr. Paul Wassmann	University of Tromsø, Norway.

Originator Protocols

Dr. Rolf Peinert

The trap deployment and sample handling protocols are described in the section on Moored Trap Sampling.

The microscopic analysis of the samples was conducted using an inverted light microscope after settling a known volume of trap material sub-sample following the protocol of Utermöhl, 1958.

Dr. Paul Wassmann

Samples were collected using a drifting sediment trap array and processed as described in the section on Drifting Trap Sampling.

Sub-samples for microscopic examination were taken and fixed with glutaraldehyde (~4% final concentration). Sedimented faecal pellets were enumerated under an inverse microscope according to Utermöhl (1958).

The pellets were classified according to their shape as cylindrical, spherical and ellipsoid. Some of these categories were then separated into size classes according to their width. The faecal pellet volume (FPV) was calculated using appropriate stereometrical configurations according to Edler (1979).

If possible a minimum of 100 pellets was counted per sample. To calculate the faecal pellet carbon content a factor of 0.061 mg C mm^{-3} obtained by González and Smetacek (1994) was used

Transparent Exopolymer Particle Flux

Parameter Code Definition

TEPFSPXA Transparent exopolymer particle (TEP) flux as xanthan equivalent
Spectrophotometric analysis of trap material
Milligrams/m2/day

Originator Code Definition

Charles Darwin cruises CD114A and CD114B

61 Dr. Paul Wassmann University of Tromsø, Norway.

Originator Protocol

Dr. Paul Wassmann

Samples were collected using a drifting sediment trap array and processed as described in the section on Drifting Trap Sampling.

The TEP was filtered and measured spectrophotometrically according to Passow and Alldredge (1995). 5 replicate samples were taken from each depth.

Radioisotope Data

Parameter Code Definitions

L210GSPS Lead-210 activity in sediment trap material
Gamma spectrometry
Bequerels per kilogram

R226GSPS Radium-226 activity in sediment trap material
Gamma spectrometry
Bequerels per kilogram

SL10GSPS Lead-210 activity in sediment trap material standard error
Gamma spectrometry
Bequerels per kilogram

SR26GSPS Radium-226 activity in sediment trap material standard error
Gamma spectrometry
Bequerels per kilogram

ST28GSPS Thorium-228 activity in sediment trap material standard error
Gamma spectrometry
Bequerels per kilogram

T228GSPS Thorium-228210 activity in sediment trap material
Gamma spectrometry
Bequerels per kilogram

Originator Code Definition

Pelagia cruise PLG109

139	Dr. Sabine Schmidt	CNRS, Gif-sur-Yvette, France

Originator Protocol

Dr. Sabine Schmidt

The data were supplied in units of dpm/g. These were converted to Bq/kg by multiplying by 1000 and dividing by 60.

Activities of radionuclides were measured by non-destructive gamma spectrometry on 0.5 - 3 g of dry trap material. Counting was conducted using low-background, high-efficiency well-type Ge detectors: one of 130 cm^3

at the laboratory and two (215 and 430 cm^3) at the "Laboratoire Souterrain de Modane (LSM)" in the French Alps. The standards used to calibrate the detectors were a mock-up of sediment and a U-Th U.S. standard from the National Bureau of Standards.

Moored Trap Sampling

Trap Moorings

Long-term, bottom-tethered moorings incorporating sediment traps, current meters and transmissometers were deployed along the OMEX II 'P' line from July 1997 until January 1999. The moorings were designed to have net positive buoyancy of approximately 600kg to ensure that the mooring lines remained vertical and that the instruments remained at constant depth throughout the deployment.

The positioning of the traps within the water column was designed to avoid placing traps in boundary layers. Deeper traps were placed far enough away from the seabed (at least 400m) to prevent the collection of locally resuspended benthic material. The shallowest traps were placed below the depth of winter mixing (to quantify the primary particle flux from the surface pelagic community.

Details of the trap mooring configurations are given in the following table.

Mooring	Water depth	Position	Instrument depth	Instrument
IM2	1500 m	42°38.5'N, 9°42.3'W	580 m	Sediment trap
			600 m	Current meter
			650 m	In situ pump
			1050 m	Sediment trap
			1070 m	Current meter
			1120 m	In situ pump
IM3	2230 m	42°37.5'N, 10°01.5'W	570 m	Sediment trap
			590 m	Current meter
			645 m	In situ pump
			1050 m	Sediment trap
			1070 m	Current meter
			1750 m	Sediment trap
			1770 m	Current meter

The moorings were initially deployed from cruise Pelagia PLG109 in July 1997. Both moorings were successfully recovered, serviced and redeployed by Poseidon PS237_1 in March 1998. Meteor M43_2 successfully recovered the IM3 mooring in January 1999. A fishing vessel recovered the upper part of IM2 adrift in December 1998. The remainder of the mooring was lost.

No useful data were returned from the SAPs (only fitted for the second deployment) and the bottom trap on the IM3 mooring malfunctioned on both deployments. The bottom current meter flooded during the second deployment at IM3.

Sample Collection

Sinking particles were collected using large-mouth particle interceptor traps of the 'Kiel' type (Fa. AQUATEC), having an opening area of 0.5 m^2. Each trap was fitted with an automated rotating carousel capable of collecting up to 20 samples over pre-determined periods. Sampling intervals varied from 7 days in spring to 28 days in winter.

Prior to deployment, the sampling cups were filled with water collected from 1000m depth, poisoned with 0.14% $HgCl_2$. On recovery, 0.07% $HgCl_2$ solution was added to the samples to compensate for poison loss during the deployment. Samples were stored in the cold and dark until processed in the laboratory.

Sample Processing

After the supernatant fluid was siphoned off, the sediment trap samples were manually picked to remove swimmers. The samples were split using a Plexiglas splitting chamber with tested precision and the sub-samples distributed for analysis.

The supernatant fluid was analysed for dissolved nutrients.

Drifting Trap Sampling

Drifting sediment trap rigs were deployed daily during both legs of Charles Darwin CD114 in August 1998. The rig used on leg A had three traps at 30m, 40m and 50m. The rig used on leg B had eight traps at 30m, 40m, 50m, 60m, 90m, 120m, 150m and 200m. The traps were parallel cylinders (0.072 m diameter and 0.45 m high) mounted in a frame, which ensured that the cylinders were kept vertical and never shaded each other. The rig was held vertical in the water by a weight at the base and sub-surface buoyancy.

Each deployment lasted for approximately 24 hours. No poison was used during the trap deployments. Consequently, modification of the trap material through grazing and bacterial decomposition during the deployment might have occurred.

After recovery, the trap material was transferred to bottles and kept cold and dark. Sub-sampling was done within 6 hours of recovery by thoroughly mixing the sample and splitting it with a bird pipette.

Duplicate sub-samples were filtered through Whatman GF/F filters for pigment, POC and PON determinations. Copepods were removed from the filters using forceps.

Sub-samples for microscopic examination were fixed with ethanol glutaraldehyde Lugol solution.

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